

## REMARKS

### Claim Amendments

As explained below, Claims 3, 8, 10-12, 25 and 26 have been rewritten in independent form.

Claims 4-6 and 9 have been amended to depend from claim 1 rather than canceled claim 2.

### Missing Information Disclosure Statement

Applicants note that the Form 1449 submitted with their Information Disclosure Statement of 3/11/02, was not among those signed and initialed by the Examiner and returned with the 6/18/04 Office Action, even though Applicants' records indicate that the Form 1449 was received by the Office. Applicants have enclosed herewith a copy of the USPTO-stamped-received postcard mailed 3/11/02 and stamped received on 3/19/02 listing the Form 1449 as having been received. The missing Form 1449 listed U.S. Patent Application Publication Nos. 2001/0049046 A1 to Butler and 2002/0005508 A1 to Butler et al. Applicants are submitting herewith a copy of the missing Form 1449 so that these references can be considered by the Examiner.

Applicants also acknowledge the Examiner's comment that a listing of references in the specification is not a proper information disclosure statement. 6/18/04 Office Action, page 2, second bulleted paragraph. Applicants agree, and they have complied with their duty to disclose by submitting references via proper Information Disclosure Statements.

Accordingly, Applicants have canceled without prejudice claims 33-46, which had been withdrawn from consideration.

#### Claim Objections

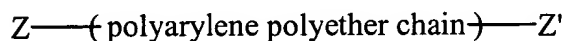
Applicants appreciate the acknowledgement that claims 3, 8, 10-12, 25 and 26 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 3, 8, 10-12, 25 and 26 have accordingly been rewritten in independent form including all of the limitations of the original base claim and any intervening original claims, and Applicants respectfully request their reconsideration and allowance.

#### Claim Rejections Under 35 U.S.C. § 103(a)

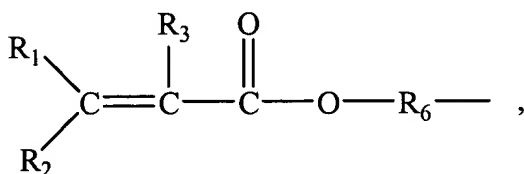
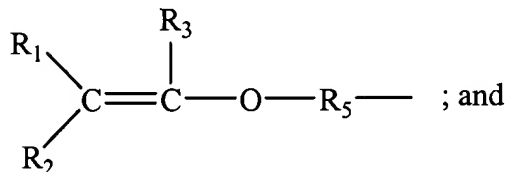
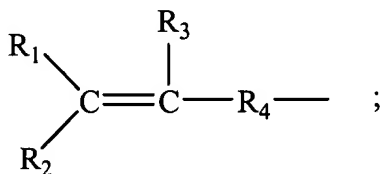
Claims 1, 2, 4-7, 9, 13-24, and 27-32 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Statutory Invention Registration No. H521 to Fan (hereinafter "Fan") in view of U.S. Patent No. 5,189,116 to Boyd et al. (hereinafter "Boyd"). Applicants respectfully traverse this rejection.

Fan generally describes end-capped polyarylene polyether resins having the formula:



wherein Z and Z' are each a monovalent unsaturated organo radical. Fan abstract. Fan's end-capped polyarylene are prepared by a three step process: (1) reacting a dihydric phenol with base to form a diphenoxide salt, (2) reacting the diphenoxide salt with an activated dihaloaromatic compound to form a phenoxide di-terminated poly(arylene ether), and (3) reacting the phenoxide di-terminated poly(arylene ether) with a monovalent unsaturated organo compound to produce the end-capped polyarylene polyether. Fan, col. 6, l. 53 to col. 8, l. 3. The dihaloaromatic compound "has the two halogens bonded to benzene rings having an electron withdrawing group in at least one of the positions ortho and para to the halogen group." Fan, col. 14, ll. 36-39. Sulfones are

the preferred electronic groups. Fan title, col. 14, ll. 59-60. The capping group is described as “selected from the group consisting of



wherein R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> each is hydrogen, an aliphatic hydrocarbon radical containing 1 to 20 carbon atoms, an alicyclic hydrocarbon radical containing 1 to 20 carbon atoms or an aromatic radical, and R<sub>4</sub>, R<sub>5</sub> and R<sub>6</sub> each is a divalent alkylene radical containing 1 to 20 carbon atoms, a divalent arylene radical containing 6 to 10 carbon atoms or a divalent cycloalkylene radical containing 3 to 8 carbon atoms. Fan, col. 8, ll. 4-29. These capping group structures exclude the possibility that the capping group includes a maleimide moiety. As acknowledged by the Examiner, Fan does not teach Applicants’ claim 1 conductive agents. 6/18/04 Office Action, page 5, first full paragraph. Fan does not mention bismaleimide resins. The Fan compositions are allegedly useful for preparing “molded products for appliances and electronics, high temperature laminates and adhesives and protective and insulative coatings.” Fan abstract.

Boyd generally describes resin systems containing a bismaleimide resin, a low viscosity epoxy resin, and a swellable or soluble thermoplastic polyimide. Boyd abstract, col. 4, 6-11. Many suitable bismaleimide resins are taught. Boyd, col. 4, l. 25 to col. 5, l. 16. Among these are “higher molecular weight bismaleimides . . . prepared by the reaction of maleic anhydride with a suitable amine terminated oligomer such as the . . .

polyarylene ether sulfones, polyarylene ether ketones, and the like.” Boyd, col. 5, ll. 5-10. Thus, the only disclosure of polyarylene ethers in Boyd is the use of amine-terminated polyarylene ether sulfones and polyarylene ether ketones as precursors to prepare bismaleimide resins. Boyd’s compositions are allegedly useful for preparing carbon fiber reinforced composites, particularly as structural materials for aerospace applications. Boyd, col. 1, ll. 19-26.

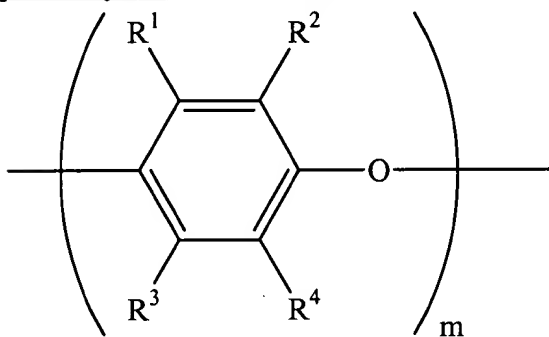
Applicants’ claim 1 has been amended to incorporate the limitations of claim 2 as filed, and further amended to recite that substructure “J” of the capped poly(arylene ether) structure  $Q(J-K)_y$  consists of the specified repeating unit. Amended claim 1 is reproduced below for the convenience of the Examiner.

1. (currently amended) A thermoset composition, comprising:  
a functionalized poly(arylene ether);  
an alkenyl aromatic monomer;  
an acryloyl monomer; and  
a conductive agent;

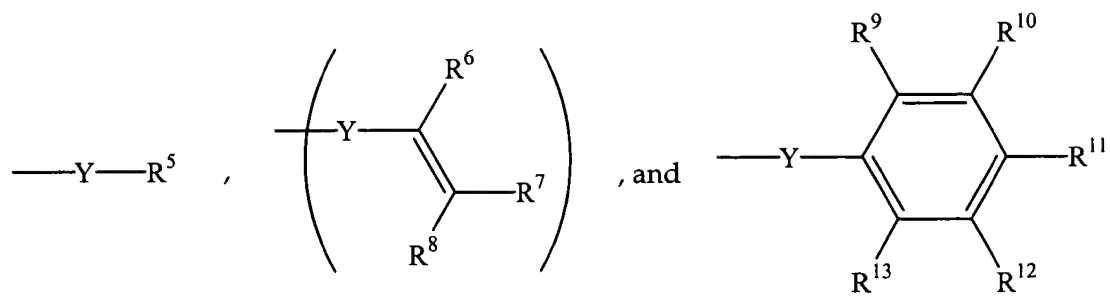
wherein the functionalized poly(arylene ether) is a capped poly(arylene ether) having the structure

$Q(J-K)_y$

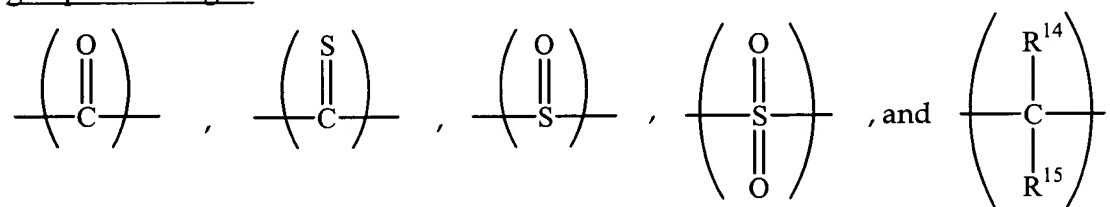
wherein Q is the residuum of a monohydric, dihydric, or polyhydric phenol; y is 1 to 100; J consists of recurring units having the structure



wherein  $R^1$ - $R^4$  are each independently selected from the group consisting of hydrogen, halogen, primary or secondary  $C_1$ - $C_{12}$  alkyl,  $C_2$ - $C_{12}$  alkenyl,  $C_2$ - $C_{12}$  alkynyl,  $C_1$ - $C_{12}$  aminoalkyl,  $C_1$ - $C_{12}$  hydroxyalkyl, phenyl,  $C_1$ - $C_{12}$  haloalkyl,  $C_1$ - $C_{12}$  hydrocarbonoxy, and  $C_2$ - $C_{12}$  halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms; m is 1 to about 200; and K is a capping group selected from the group consisting of



wherein  $\text{R}^5$  is  $\text{C}_1\text{-C}_{12}$  alkyl;  $\text{R}^6\text{-R}^8$  are each independently selected from the group consisting of hydrogen,  $\text{C}_1\text{-C}_{12}$  alkyl,  $\text{C}_2\text{-C}_{12}$  alkenyl,  $\text{C}_6\text{-C}_{18}$  aryl,  $\text{C}_7\text{-C}_{18}$  alkyl-substituted aryl,  $\text{C}_7\text{-C}_{18}$  aryl-substituted alkyl,  $\text{C}_2\text{-C}_{12}$  alkoxy carbonyl,  $\text{C}_7\text{-C}_{18}$  aryloxy carbonyl,  $\text{C}_8\text{-C}_{18}$  alkyl-substituted aryloxy carbonyl,  $\text{C}_8\text{-C}_{18}$  aryl-substituted alkoxy carbonyl, nitrile, formyl, carboxylate, imidate, and thiocarboxylate;  $\text{R}^9\text{-R}^{13}$  are each independently selected from the group consisting of hydrogen, halogen,  $\text{C}_1\text{-C}_{12}$  alkyl, hydroxy, and amino; and wherein Y is a divalent group selected from the group consisting of



wherein  $\text{R}^{14}$  and  $\text{R}^{15}$  are each independently selected from the group consisting of hydrogen and  $\text{C}_1\text{-C}_{12}$  alkyl.

Applicants respectfully submit that their claim 1 is patentable over Fan in view of Boyd because (1) one of ordinary skill in the art would not be motivated to combine Fan and Boyd, and (2) even if one of ordinary skill in the art were motivated to combine Fan and Boyd, one would not obtain Applicants' claim 1 composition.

First, there is no motivation for one of ordinary skill in the art to combine Fan and Boyd, and, in particular, to cherry-pick carbon fibers from Boyd to incorporate into the compositions of Fan. "When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references." *Ecolchem, Inc. v. Southern California Edison Co.*, 56 U.S.P.Q.2d 1065, 1073 (Fed. Cir. 2000). "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight." *In re*

*Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). For one of ordinary skill in the art to be motivated to combine references, the references must be from analogous art areas. *In re Clay*, 966 F.2d 656, 658-659 (Fed. Cir. 1992). A secondary reference is analogous art with respect to a primary reference if the secondary reference is (1) from the same field of endeavor, regardless of the problem addressed, or (2) not from the same field of endeavor, but reasonably pertinent to the particular problem with which the inventor is involved. *Id.* at 658-659. Fan and Boyd are not from the same field of endeavor. Fan describes compositions in which the primary component is a polyethersulfone with a capping group at each end of the molecule having the structure described above. The Fan polyethersulfones cannot be capped with maleimide groups. Boyd describes compositions in which the primary component is a bismaleimide resin. Boyd's compositions are specifically for use in carbon fiber composites, whereas Fan does not describe the use of carbon fibers. The Fan and Boyd compositions are thus compositionally distinct – note in particular that their polyethersulfone components are chemically distinct – and therefore from different fields of endeavor. Furthermore, Boyd and Fan address problems that are distinct from each other and distinct from that addressed by Applicants. Fan is directed to compositions useful for preparing “molded products for appliances and electronics, high temperature laminates and adhesives and protective and insulative coatings.” Fan abstract. Boyd's compositions are useful for preparing carbon fiber reinforced composites, particularly structural materials for aerospace applications. Applicants' compositions are useful for preparing highly conductive articles, such as fuel cell bipolar plates. Thus Fan and Boyd and the present application are each addressed to different problems. Fan and Boyd are therefore not from analogous art areas, and there is no motivation to combine them for any reason, let alone to take only the carbon fibers from Boyd in order to incorporate them in the resin compositions of Fan. Applicants respectfully submit that the only possible motivation for such a selective combination is impermissible hindsight.

Second, even if one of ordinary skill in the art were motivated to combine Fan and Boyd, one would not obtain Applicants' claim 1 composition. Establishing a *prima facie* case of obviousness requires that all elements of the invention be disclosed in the prior art. *In re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A 1970). Applicant's claim 1 recites a

capped poly(arylene ether) structure in which the repeating units of the polymer, contained in substructure J of the polymer structure  $Q(J-K)_y$ , consist of phenylene ether units in which the phenylene group is substituted with groups  $R^1-R^4$  which are independently selected from hydrogen, halogen, primary or secondary  $C_1-C_{12}$  alkyl,  $C_2-C_{12}$  alkenyl,  $C_2-C_{12}$  alkynyl,  $C_1-C_{12}$  aminoalkyl,  $C_1-C_{12}$  hydroxyalkyl, phenyl,  $C_1-C_{12}$  haloalkyl,  $C_1-C_{12}$  hydrocarbonoxy, and  $C_2-C_{12}$  halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms. Applicants' capped poly(arylene ether) therefore excludes the strong electron withdrawing groups required by Fan (i.e., derived from the dihaloaromatic compound from which Fan's end-capped polyarylene polyethers are synthesized) and also excludes the ketone and sulfone groups required by Boyd. Not also that Applicants' capping group structure K excludes the maleimide groups required by Boyd's bismaleimide compounds obtained from amine-terminated polyarylene ether sulfones and polyarylene ether ketones. Thus, Fan and Boyd fail to teach Applicants' claim 1 capped poly(arylene ether)s, and Fan and Boyd therefore do not support a prima facie case of obviousness against claim 1. Claim 1 is therefore patentable over Fan in view of Boyd.

Applicants also note that claims 30 and 31 are further patentable over Fan and Boyd. Fan and Boyd fail to teach the use of curing promoters generally, or the specific curing promoters of claim 31.

Given that claim 2 has been cancelled, and given that claims 4-7, 9, 13-24, and 27-32 each include or further limit all the limitations of claim 1, Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 1, 4-7, 9, 13-24, and 27-32 under 35 U.S.C. § 103(a) over Fan in view of Boyd.

#### Nonstatutory Double Patenting Rejections

Claims 1, 4, 15, 16, 18, 19, 22, 24, and 28-29 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 2, 4, 11, 19, 20, and 30 of U.S. Patent No. 6,617,398 to Yeager et al. Notwithstanding the present claim amendments, Applicants are submitting herewith a terminal disclaimer in compliance with 37 CFR § 1.321(c) to overcome the rejection.

New Claims

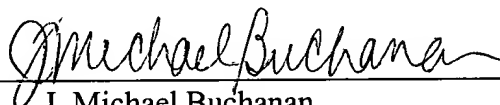
Claim 47 has been added to further claim the invention. Claim 47 is supported by claim 2 as filed.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 07-0862 maintained by Assignee.

Respectfully submitted,

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